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Archipelago. He had previously communicated valuable papers upon Borneo and other subjects, which were printed in the Transactions of the Society. The paper had, geographically speaking, quite a unique character, for the author, judging from the nature of the animals and plants that are found in these different islands, showed how and when former continents must have been separated from each other, and how the respective *floræ* and *faunæ* of ancient continents are now to be found almost within a few miles of each other.

The Paper, which was entitled,—

On the Physical Geography of the Malay Archipelago,

was then read by Mr. MARKHAM, Secretary.

MR. WALLACE, after briefly glancing at the importance of his subject, which, he said, furnished the most extensive and varied materials for speculation in almost every department of scientific inquiry, proceeded to classify the topics treated of in his paper, the first section of which consisted of a tolerably precise determination of the limits of the Archipelago, with data as to the position, extent, and magnitude of the principal islands; the great object being to define the eastern boundary of the region in question, where, unless due care be taken to verify its limits, geographers are apt to conceive that it blends insensibly with the various Pacific groups usually classed as Polynesia. This archipelago—for which he proposed the name Indo-Australian in lieu of Malay—he held to extend from the Nicobars on the north-west (Mr. Wallace did not mention the Andamans), to San Cristoval, one of the Solomon Islands, on the south-east; and from Luzon on the north, to Rotti, at the south-west angle of Timor, on the south; being an irregularly triangular area of $29\frac{1}{2}^{\circ}$ latitude, by 69° of longitude. For ethnological and other purposes stated in the paper, the Malay peninsula, though a portion of the mainland, is included in this insular belt; and analogous reasons induced the determination of the eastern limit. After strongly advocating the insertion in all future atlases of a special map of these islands, comprising so many varieties of man, so many different tribes, and such variety of physical phenomena as to entitle it almost to be regarded as the sixth great division of the globe (Australia being the fifth), Mr. Wallace alluded to the immense number of active and extinct volcanoes (the islands in which the former occur being unusually liable to earthquakes), as also to the immense forests which, throughout a great portion of the Archipelago, clothe even the loftiest hills to their summits; while in other portions these give place to arid hills and plains scantily covered with scrub. The meteorological phenomena display similar

contrasts, some of the islands experiencing the monsoons with the utmost regularity, while others show an inconstancy of climate resembling our own. But the most marked feature of the physical geography of the region is to be found in the fact that one large section is connected by a very shallow sea with the continent of Asia, while a similar submarine plateau unites another portion to Australia; the intervening belt of ocean being almost unfathomable.

Mr. Wallace then subdivided the islands into—I. Volcanic, and Non-Volcanic; II. Forest Country and Open Country; III. Well-marked Seasons and Undefined Seasons; and IV. Western, or Indo-Malayan Region; and Eastern, or Austro-Malayan Region.

As to the first, Borneo and Celebes formed two central masses, round which the volcanic islands are distributed in a band about 5000 miles in length, roughly conforming to their outline, and comprising about 50 active volcanoes. Throughout this entire length are to be found, at innumerable points, most convincing evidences of frequent upheavals and depressions of land, especially of upraised coral reef. In strong contrast is the island of Celebes, throughout its singularly-complicated form, the great mass of Borneo and the whole Malay peninsula, which, like Celebes in this respect, have absolutely no volcano, active or extinct; and there is a similar quiescent area, 1000 miles wide, in the great island of New Guinea, where no volcano is known to exist nor earthquake to occur, in an island which Mr. Wallace estimates to contain 290,000 square miles, or 53,000 more than Borneo, hitherto regarded as, after Australia, the largest island in the world. Still further to the east occur a few small active volcanoes.

The author then noticed the variations of soil, and endeavoured to account for the extraordinary configuration of Celebes and Gilolo, which have been variously accounted for, but which he did not feel disposed to attribute to volcanic action (there being but a few volcanoes at the extreme northern end of Celebes), but rather to the alternation of forces acting in opposite directions, which nearer home have been known to raise and depress large tracts of land several hundreds of feet within comparatively short geological periods. He then briefly stated his reasons for believing Borneo to have been long stationary, before proceeding to touch upon the contrasts of vegetation and climate, which he proposed to consider together, and of which he gave numerous most interesting particulars, tracing their varying features to climatic and other influences.

He next adverted to the change of the seasons, which in many

parts seems, at first sight, to follow no known law, though an accurate and prolonged series of observations would doubtless enable us to determine them.

“Speaking generally,” said Mr. Wallace, “the whole southwestern part of the Archipelago, including the whole range of islands from Sumatra to Timor, with the larger half of Borneo and the southern peninsula of Celebes, have a dry season from April to November, with the south-east monsoon. This same wind, however, bends round Borneo, becoming the south-west monsoon in the China Sea, and bringing the rainy season to Northern Borneo and the Philippines. In the Moluccas and New Guinea the seasons are most uncertain. In the south-east monsoon, from April to November, it is often stormy at sea, while on the islands it is very fine weather. There is generally not more than two or three months of dry hot weather about August and September. This is the case in the northern extremity of Celebes and in Borneo, whereas in Amboyna July and August are the worst months in the year. In Ternate, where I resided at intervals for three years, I never could find out which was the wet and which the dry season. The same is the case at Banda, and a similar uncertainty prevails in Menado in Celebes, showing, probably, that the proximity of active volcanoes has a great disturbing meteorological influence. In New Guinea a great amount of rain falls, more or less, all the year round. On the whole, the only general statement we can make seems to be, that the countries within about 3° on each side of the equator have much rain and not very strongly-contrasted seasons; while those with more south or north latitude have daily rains during about four months in the year, while for five or six months there is almost always a cloudless sky and a continuous drought.”

The Paper now passed to the consideration of the geological formations and zoological products, and broadly stated it as a recognized fact that one portion of the Archipelago is entirely Asiatic, while the remaining portion is quite as distinctly Australian. With the additional information since obtained, Mr. Wallace combated a theory advanced by Mr. Windsor Earl in a Paper read before the Royal Geographical Society in 1845, in which that gentleman argued from the existence of shallow seas between the mainland of Asia and the immediately adjacent islands at one end, and of a similar shallow sea uniting Australia with New Guinea at the other, that Australia was once part of Asia. Mr. Wallace remarked, that had Mr. Windsor Earl been better acquainted with the natural history of the various regions, he would not have advanced a proposition “to which the whole bearing of the facts in physical geography and

natural history is opposed." In support of this view, he briefly discussed the relations of the geographical distribution of animals and plants with geology; and claimed that the same changes in geological distribution of land and water, of which we have so many evidences in our present acquaintance with the constituents of the earth's crust, are still going on. Hence we shall find that wherever upon islands contiguous to each other or to a continent animals or plants of the same or closely analogous descriptions are observed, it will be found, upon investigation, that the sea between them is decidedly shallow; and by parity of reasoning, that where a deep sea divides islands from each other, there entirely different types will be found. While enlarging upon this branch of his subject, he pointed out that an upheaval of only 50 fathoms would, to judge by soundings, make dry land of the whole sea intervening between Borneo, Java, and Sumatra, and the mainland of Malacca and Siam, while the 100-fathom line of similar soundings includes the Philippines and other groups; from which fact he argues the comparatively recent submergence of this part of Asia, which he ascribes to violent volcanic action. He then adduced a variety of arguments from the zoological world, instancing examples both of *carnivora* and *ruminantia*, which are common to the islands named and to Southern Asia, while they are totally unknown to Australia, yet which could never have reached the islands of the Western section from the mainland of Asia, so long as the ocean retained its present configuration.

After noticing a few anomalies observable in the Philippines, which could sufficiently be accounted for by the more remote period at which they were cut off from Asia as indicated by the greater depth of the intervening ocean, Mr. Wallace proceeded to apply a similar chain of reasoning to the islands from Celebes and Lombok eastward, which he showed to present all the characteristic features of having been united to Australia, as indicated by the shallow sea between, and the similarity of fauna and flora between the Eastern section of the Indo-Australian Archipelago and Australia, as evidenced by two Tables (which will appear in the Society's 'Transactions').

Starting from this point, the writer then proceeded to demonstrate that the dividing line between these may become so narrow that a few miles only may carry the traveller from one great division of the earth (as measured by dissimilarity of productions) to another; and, in proof of this, instanced the Strait, barely 15 miles wide, between Bali and Lombok, which marks the dividing line between the Asian and Australian kingdoms of Natural History. From

these various *data* he drew the general conclusion that all the islands eastward of Borneo and Java formed part of an Australian or Pacific continent, from which they were separated at a period, not merely long antecedent to the submergence of the adjacent portion of the Asiatic continent, but probably long before any portion of South-Eastern Asia emerged from the waves; basing the conclusion upon the comparatively recent geological formation of Java and Borneo, and on the great depth of the sea between Borneo and the Eastern section of the Archipelago, which, upon his theory, pointed to a very remote period at which the two continents of Asia and Australia were separated.

He invited particular attention to the fact that the division of the Archipelago which he had pointed out did *not* correspond to any physical or climatal divisions; that the volcanic band runs through both sections; and that the climates of Borneo and New Guinea are very similar; yet that, in spite of these, which are usually deemed the necessary conditions for ensuring similarity of animal life, the most striking contrast between them respectively at once forces itself even upon the most unobservant traveller. He then illustrated the difference between these two sections of the Archipelago by speculating as to what would be the consequence of the two continents of Africa and South America becoming joined in the course of ages by the slow upheaval of the Atlantic bed, the erosive agency of rivers on either continent, and other similar causes, followed by a sudden violent divulsion along the axis of what had been the ocean. If, then, a renewed period of upheavals occurred, islands would have been formed similar to those of the Indo-Australian Archipelago, yet equally dissimilar as to Natural History. The Paper concluded by urging upon naturalists increased devotion to that science, as tending to throw light upon many of the most recondite questions of the earth's previous history.

The PRESIDENT remarked that as a geologist, he must say, in all the years he had had the honour of being connected with the Society, he had never heard a paper read of a more luminous character, and which so bound together in the most perfect forms all the branches of the science of natural history, more particularly as it developed the truths of geography upon what he considered to be its soundest basis, that of geological observation and analogy. He was perfectly certain there was no person present, who could not say that they had never sent a traveller into a foreign country, who had more completely studied all the grand features of its natural history, or who had combined them together in a more profoundly philosophical spirit.

Mr. CRAWFORD said the subject of the Malay Archipelago had been the study of his life; but he felt himself much enlightened by the paper of Mr. Wallace. He did not know that he could add any information. He might not entirely agree with all his theories, and, perhaps, not even with his divisions of the Archipelago; but for all that, his paper was a most enlightened

and a most able one. He wished Mr. Wallace had said something about the human inhabitants of these regions. Mr. Wallace knew more about them than any Englishman, for he had lived among them; and he should be glad to hear his opinion of them. He divided the Archipelago into two parts, the Indian portion and the Australian portion. Now he wished to ask Mr. Wallace, seeing that he conjoined Australia and New Guinea as part of the same region, how it happened that the human inhabitants were totally different? Again, if the Indo-Malay portion of the Islands were grouped with India, how came it that no two human beings could be more unlike than the Hindoo and the Malay? How did the Malays come there? How were the dwarfish inhabitants of the Andaman Islands to be accounted for? for there were no such people in India—that was certain. How were the pigmy negroes of the Malay Peninsula to be accounted for? There were differences here which he (Mr. Wallace) might perhaps be able to reconcile. Mr. Wallace had mentioned the eruption of the mountain Tomboro. He was himself old enough to have been an eye-witness of the commencement of that eruption, probably the most remarkable one on record. In the year 1814 he proceeded with an expedition to the island of Celebes; and as they approached the island of Sumbawa, which contained this famous mountain, they thought they saw a very heavy squall coming on. They were beating up against the south-east monsoon, and as they approached they saw that it was a volcano. As they beat up nearer the shore of the island, the ashes fell on the deck. That was one whole year before the great eruption took place. He was then at Soerabaya, at the eastern extremity of Java, about 300 miles distant from the mountain of Tomboro. For three days it was pitch dark. Mr. Wallace had greatly underrated the extent of ashes that were ejected, which were certainly not confined to an area of 300 miles, as they fell at Bencoolen, 1200 miles distant, transported thither by the south-east monsoon; and they were carried by a second current of air a thousand miles in an opposite direction, as far, in fact, as the island of Banda. For ten days he had to write by candlelight; and the country-people were compelled to travel into the country with flambeaux. For six weeks together they could not see the plain disc of the sun. There was one difference between the volcanic and non-volcanic portions of these islands. Generally speaking, the volcanic part was highly fertile. Mr. Wallace had given a just eulogy of the island of Java. He himself resided on that island six years, and he was tolerably well acquainted with it. Java was about half the size of Great Britain; it was a fertile island, beautifully watered, and at present contained a population of full 12,000,000; indeed, the last accounts make it about 13,200,000. On the other hand, he did not believe the population of Borneo exceeded four or five inhabitants to the square mile, and probably on the whole did not exceed one million and a quarter. If Borneo were as fertile as Java, as well watered, and as suitable to maintain a population, it ought, according to its immense size, to contain a population of 80,000,000. The people of Java were civilised, having fine monuments and a literature. The whole of the inhabitants of Borneo, who were not strangers, were savages. There was a still more remarkable example. Mr. Wallace had mentioned the islands of Bali and Lombok. Now, those two very small islands were highly fertile, and although they were not above one-eightieth part of the size of Borneo, they contained a population equal to that of Borneo, and a civilised population too, well-clothed and well-fed, and possessing a literature. These were striking differences between the volcanic and non-volcanic islands.

Mr. WALLACE said with regard to the question that Mr. Crawford had asked, why he did not refer to the races of men inhabiting these islands, it was simply because his paper was already too long, and it would require another paper equally long to do justice to the subject.

Mr. CRAWFORD.—Will you promise one?

Mr. WALLACE.—Certainly. He should just like to say a word with regard

to the number of very difficult problems that Mr. Crawfurd had proposed to him—problems which, as Mr. Crawfurd, who had devoted his whole life to the subject, was unable to answer, it was not likely he should be able to answer upon such short notice, if indeed at all. However, he would say, generally, that the races of man do not correspond at all accurately to those two great divisions of the Archipelago, which differed so remarkably in their natural productions. The reason why they did not correspond appeared to him to be simply this; that man is a migratory animal and continually moving about. We had a great deal of historical evidence of the number of changes of the races of man in the Archipelago itself. Some races have been driven out; others have come in; others have made conquests; others have gone to more fertile regions. Therefore, the races of man would not correspond to those of animals and plants. Still there was a slight general correspondence. There was the Malay race, the whole of which, generally speaking, corresponded to the western half of the Archipelago; they did stretch into the eastern half, but not a great part of it. The Papuan race occupied the eastern half, and extended into New Guinea. It was probable they had extended still further west, but they had been driven back by the Malayan race.

The PRESIDENT, in adjourning the Meeting, congratulated them upon having had from Mr. Wallace a proof that Geography as a science embraced all the sciences relating to Natural History. He had proved himself not alone a first-rate naturalist, but also a good geologist.

The Meeting then adjourned, after a cordial vote of thanks had been unanimously passed to Mr. Wallace for his most interesting and instructive paper.

Fifteenth (Special General) Meeting, Monday, 22nd June, 1863.

SIR RODERICK I. MURCHISON, PRESIDENT, in the Chair.

As already mentioned in the record of the Proceedings of the Meeting of the 8th June, it was on that occasion announced by the President (*v. ante* p. 204), that Captains Speke and Grant were at latest accounts on their way home from the scene of their splendid discoveries; and those gentlemen having in the interim landed at Southampton on the 17th June, notices were immediately sent out from the Offices of the Society, calling a Special General Meeting for the above evening.

ELECTIONS.—*Sir Alexander Gordon Cumming, Bart.; R. H. Davies; Edward Francis Dayrell; Gardner D. Engleheart; Alexander Ferguson, Esqrs.; Major-General Alexander Peto Le Mesurier; S. P. Low; Alexander McArthur; John Remington Mills, M.P., Esqrs.; Sir Robert Phillimore; Russell Brooke Robertson; Thomas F. W. Walker, M.A.; Swinburne Ward; and John Westlake, Esqrs., were elected Fellows.*

DONATIONS.—Admiralty Charts and Ordnance Maps; Maps of Belgium, presented by Mr. Ph. Vander Maelon, of Brussels.

EXHIBITIONS.—Views of Napoleon Falls, Lake Nyassa, and nu-

merous photographs of natives and scenery along the line of Captain Speke's route, from Zanzibar to Gondokoro; spears and shields, &c.

The President having entered the Hall, with great difficulty forced his way to the chair. He would not, he said, commence the proceedings until Captain Speke had been placed on his right hand, and Captain Grant on his left, which arrangement was effected with no little difficulty.

In introducing Captains Speke and Grant, the President said:—

GENTLEMEN, we are now specially assembled (for our regular Session has terminated) to do honour to the two men who have accomplished the most remarkable geographical feat which has been performed in our time, and one which it has been the ambition of other nations to accomplish during all ages. The Council of this Society has the greater reason to be proud of this achievement, because it was by their exertions that the means were obtained to carry it out; and Her Majesty's Government and the Indian Government must also have a real gratification, in reflecting that they complied with the wishes of the geographers who organised the East African expedition, in furnishing the essential means of accomplishing it. But, Gentlemen, whilst we may dwell with satisfaction on the encouragement we warmly offered, let us at once turn to the man without whose earlier as well as recent labours, this great feat could never have been brought about—I mean, of course, Captain Speke. In the year 1858, when serving with our former medallist, Burton, and when that eminent explorer lay sick at Kazeh, Captain Speke, having heard of this lake from Arab merchants, hastened to reach it, and finding that its southern extremity was on the high plateau-land, between 3000 and 4000 feet above the sea—(the land which forms, indeed, the watershed between North and South Africa in that meridian)—and finding also that the waters of this vast lake were fresh, he, then and there, after accurately determining the longitude of its southern end, was convinced that this body of water must be the great southernmost reservoir, out of which the White or Main Nile flowed at its northern end. It was for this great discovery that the Royal Geographical Society awarded our founder's gold medal to Captain Speke. Though obliged to return to England with his leader, Captain Burton, Captain Speke held pertinaciously to his project; and engaging his Indian brother officer, Captain Grant, to accompany him (an officer, let me say, who distinguished himself, and was severely wounded in the great Indian mutinies), and encouraged by this Society and the Government, he has gone and accomplished the great deed, and has fol-